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PART FIVE

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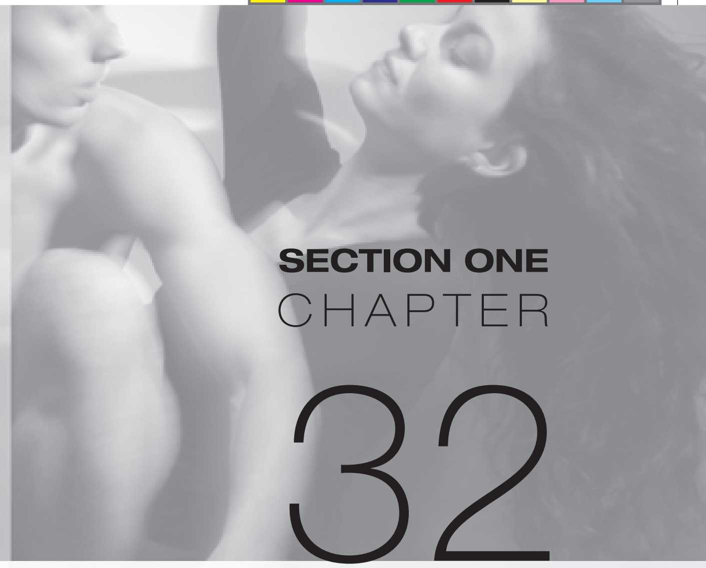
Section One

Psychological, social and motivational aspects



SECTION ONE

CHAPTER

32

Behavioral analysis, fear of movement/(re)injury, and cognitive-behavioral management of chronic low back pain

Johan W.S. Vlaeyen and Linda M.G.Vancleef

Introduction

Chronic musculoskeletal pain syndromes such as chronic low back pain (CLBP) are responsible for enormous costs for health care and society (Picavet & Schouten 2003, Verhaak et al 1998, Waddell 1987). The biomedical approach often proves insufficient to explain these pain conditions and, nowadays, the biopsychosocial view on pain offers the foundation for a better insight into how pain can become a persistent problem (Fordyce 1976, Turk & Flor 1999). The main assumption of the model is that pain and pain disability are not only influenced by organic pathology, if present, but also by biological, psychological, and social factors. As such, the distinction between somatogenic (real) and psychogenic (imaginary) pain is no longer considered relevant. In this chapter, the behavioral analysis of chronic pain will be discussed, with special attention to the role of pain-related fear in the development and maintenance of chronic pain, and the cognitive–behavioral management of chronic back pain.

Chronic back pain as a societal problem

Many people (60–90% of the population) suffer from low back pain (LBP) in the course of their lives, not all of whom seek health care (von Korff 1994). In the majority of patients who seek care and refrain from work, the problem of pain resolves within a few weeks. These patients return to work and resume their daily activities within 4–6 weeks of the onset of the complaints. However, in a small subgroup of patients (5–10% of the total population), back pain complaints persist for a period > 3 months and develop into a chronic pain problem. This relatively small group of back-pain patients is responsible for the largest amount of healthcare and societal costs of back problems (Goossens et al 1999, Nachemson 1992, Waddell 2004). What are the reasons for this group becoming chronic pain sufferers? One possibility could be that these patients have more serious impairments than those who resume daily activities earlier. However, no research supports this assumption. On the contrary, numerous studies have shown that there is no perfect relationship between impairment, pain, and disability (Peters et al 2005). Patients with back problems often show no physical injury and, conversely, not everyone who does show physical injury reports pain or disability (e.g. Jensen et al 1994). A biopsychosocial approach offers the foundations for a better insight into how pain can become a persistent problem (Turk & Flor 1999). The main assumption of this approach is that pain and pain disability are not only influenced by organic pathology, if present, but also by psychological and social factors. The interrelationship between the biological, psychological, and social factors, as well as their influence on the pain experience, is complex. For example, from a biomedical view, a return to work should be encouraged only when the underlying pathology has healed. Otherwise, the risk of (re)injury and repeated failure would increase, leading to the enhancement of chronicity. From this biomedical perspective, staying off work too long would be much safer than resuming work activities too early. The literature, however, supports the conjecture that an early return to work contributes to a decrease in long-term work disability in patients with musculoskeletal pain (Vowles et al 2004, Watson et al 2004). The for this arguments include the recognition that musculoskeletal incidents are increased by the immediate consequences – such as diminished pain, increased attention from others, avoidance of unpleasant and fearful situations, and the stability of the sick role. In other words, the pain disability is subject to a graded shift from structural/mechanical to cognitive/environmental control. A number of studies suggested that this shift occurs quite rapidly, probably within 4–8 weeks of the onset of acute pain (Deyo et al 1986, Klenerman et al 1995, Philips & Grant 1991).

Behavioral analysis

Pain is now defined as not only a sensory experience, but also as an emotional one. The International Association for the Study of Pain (IASP) has proposed the following definition of pain:

> *An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage.*

Emotional experiences can only be inferred by their effects at some observable level (Öhman 1987). Likewise, chronic pain can best be approached as a hypothetical construct that can be inferred by at least three partially independent response systems: overt pain behaviors, psychophysiological reactivity, and cognitive processes about pain and pain control (Vlaeyen et al 1989) (Fig. 32.1).

Overt pain behaviors

In the 1960s, the American psychologist Wilbert Fordyce pointed to the importance of behavioral dysfunction of the patient in analyzing the pain problem and treatment (Fordyce et al 1968). According to Fordyce, the pain behavior of the patient, rather than the pain complaint, needs to be the central issue. In making this statement, Fordyce acknowledged that the relationship between the pain experience and dysfunction is often

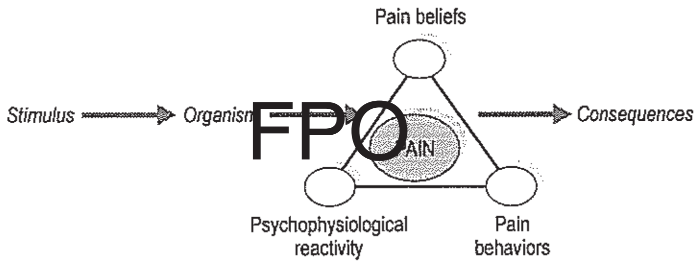


Fig. 32.1 Pain as a hypothetical construct, that can only be inferred by observable psychophysiological reactivity, pain cognitions, and pain behaviors. (Based on Öhman 1987 and Vlaeyen 1991.)

far from perfect. Pain behavior was defined as behavior from which outsiders could interfere that a person suffers from pain. This behavior might vary considerably: painful grimace, moaning, taking pain medication, a disordered posture, bed rest, avoidance of and escape from activities, isolation, work leave, etc. It is highly likely that some of these have a communicative function. The origin of other behaviors is self-protective and recuperative (Williams 2002).

According to Fordyce, pain behaviors are likely to come under the control of short-term consequences through operant conditioning principles (Fordyce 1976). Acute pain elicits evolutionarily determined self-protective behaviors; when these are able to diminish pain, they are likely to increase in frequency. A patient who experiences escaping activities reducing pain, will stop doing those activities that produce pain and will avoid them on future occasions. Performing tasks during intense pain is a frustrating and difficult experience. Alternatively, others might criticize the patient because tasks are not performed as expected. By no longer performing these activities the patient might escape his or her own feelings of frustration and avoids criticism of others. The patient might also avoid some annoying tasks or responsibilities thanks to pain. In all the abovementioned situations, pain behavior is maintained through the avoidance of negative consequences, i.e. through negative reinforcement.

Pain behavior can also be maintained through positive reinforcement. Partners and family members might reinforce pain behavior by the way they give attention to the patient (Block 1981). Support and comprehension for the pain complaint by partners and family members should not, however, be banned. Pain behavior occurs less in patients who are adequately supported by family members. A possible explanation is that, in these families, not only are support and attention is given in difficult situations, but also in situations without pain behavior or in situations in which the patient successfully copes with the pain. Indirect evidence for the role of positive reinforcement is provided by a study in which chronic pain patients were requested to perform physical tasks in the absence or presence of the spouse. In the presence of solicitous spouses, patients' pain behaviors increase, whereas the presence of punishing spouses tends to decrease pain behaviors compared to situations in which no spouses are present (Romano et al 1992).

A number of experimental studies have shown that verbal reports of pain intensity caused by repeated noxious stimulus of equal intensities can be modified through operant conditioning. Subjects who received verbal positive reinforcement from the experimenter after each trial if their report of pain intensity exceeded that of the previous trial reported significantly greater pain than the nonreinforced subjects (Jolliffe & Nicholas 2004). Of interest is that the effects of upward conditioning of pain reports appear to extinguish much more slowly in patients with chronic pain than in healthy controls (Flor et al 2002).

The general goal of the operant treatment approach is to increase healthy behaviors and activity levels, and to decrease pain behaviors and excess disability. For an extensive description we refer to Sanders (2002). In this treatment, (sometimes called graded activity), two important principles are followed: the establishment of baseline of the goal behaviors and the systematic and positive reinforcement of behaviors that are in line with those goals.

The treatment program always starts with a number of baseline trials in which the patient performs some exercises to the limit of tolerance ('until pain or discomfort make you stop'). The therapist then sets a quota of exercises to be performed each session. Initial quotas are below baseline levels but they are systematically increased towards a preset goal. During the treatment, a time-contingence between activity and rest is followed, rather than a pain-contingency. This means that the patient continues the activity until a certain amount of time has elapsed, and does not stop because of an increase in pain. In the preset exercise scheme, periods moments of activity and rest are determined and, gradually, the activity levels are built up and the rest periods are reduced. Using such a time-contingency principle, the patient learns to work towards the preset agreements, despite the pain. When the patient reaches a preset goal, this is positively reinforced. The operant graded activity approach gives patients the opportunity to discover that they can perform much more than anticipated, despite the pain.

Because partners of patients can influence pain behavior to a considerable extent, they are involved as much as possible. They might be involved in a relatively intensive training in which they learn to identify pain behavior and healthy behavior and to pay more attention to the capabilities of their partner instead of pain behavior (Kole-Snijders et al 1999). They might also be involved in training the patient in communication skills to stimulate direct communication by the patient, at the expense of the indirect communicative function of pain behavior (Keefe et al 1999).

Psychophysiological reactivity

Emotional events, stress, and pain have an influence on physiological systems such as the heartbeat, respiration, and muscle tension. In many circumstances these psychophysiological reactions are adaptive and functional. In anxiety and fear, they are part of an energetic and motor preparation for fight and flight. When in pain, muscles become tightened to avoid further pain increases. Sustained muscle contraction is, however, accompanied by a reduction of oxygen in the muscles and a hypersensitivity of the receptors, which can paradoxically increase pain. A prolonged elevated muscle tension can cause pain, even long after the tension in the muscles is released. However, it is still unclear how important this mechanism is in the maintenance of pain problems.

Although the nature of the psychophysiological responses strongly depends on situational characteristics, strong and consistent individual differences exist in physiological reactions to stress. This phenomenon has been labeled response stereotypy. Stereotypy has been extensively investigated in the chronic pain response. Indeed, a clinical hypothesis is that pain patients react to stressful situations with an automatic tensing of the muscles in the painful area. Although for a long time reliable data in favor of this hypothesis were lacking (Flor & Turk 1989), there are now several methodologically sound studies. Flor et al (1992) investigated the relationship between physiological parameters and both personal relevant and general stressors in several groups of chronic pain patients. Compared with nonpain patients, only patients with pain in the maxillary joint showed a stronger increase of the electromyographic (EMG) values of the maxillary joint muscles in the personal stress situation (talking about import life events). In particular, patients with CLBP responded by tensing the back muscles in the personal stress situation. This type of response stereotypy has also been shown to be associated with increased pain (Burns et al 1997).

The aim of relaxation exercises is to reduce muscle tension and psychophysiological reactivity. A commonly used technique is applied relaxation (Öst 1988), by which the patient learns to relax in an increasingly shorter span of time and, subsequently, to apply the relaxation response in diverse situations in which stress usually increases. Training can take place both individually and in groups, and consists of three phases: reconceptualization, skills training, and generalization. Skills training starts with progressive relaxation in which the patient learns to feel the difference between tensed and relaxed muscle group, and progresses so that the patient can relax only the required muscle group. Thereafter, so-called cues are introduced. The goal of this phase is to bring about a conditioning between a cue (e.g. the word 'relax' or a visual stimulus) and the relaxed state. By means of these cues, the patient learns to execute the relaxation response during performance of daily activities, which facilitates generalization. Sometimes training is supported by EMG biofeedback (Donaldson et al 1994). To date, relatively little empirical support exists for the effectiveness of relaxation exercises with or without biofeedback, except for headache patients (Bogaards & ter Kuile 1994). One of the reasons for the limited effectiveness relates to the fact that most treatments pay too little attention to the implementation of the learnt relaxation response in personally relevant stressful situations. Therefore, it is necessary to determine the role of psychophysiologic stressors individually for all patients, so that specific treatment can be planned for each individual patient (Arena & Blanchard 2002).

Cognitive processes

The processes involved in making sense of pain are extensively elaborated in cognitive perspectives (Jensen et al 1999, Turk et al 1983). Cognitive processes have a substantial impact on pain. Attention is an important factor, but also the attributions and expectations about possibilities of control are of influence upon the pain experience.

Attention

It makes sense that pain interrupts ongoing activities and demands attention, even in situations when the current concern of the individual is not related to pain. Pain is an evolutionary signal of bodily threat that urges escape. Despite the fact that pain can be considered to be a 'false alarm' in many situations of chronic pain, pain continues to interrupt attention. Research has revealed that the interruptive quality of pain is amplified by its intensity, novelty, unpredictability, and threat value (Eccleston & Crombez 1999). Pain can also become the focus of attention because of its immediate relevance for the current goals of the individual. There are many examples in which the processing of pain-related information has priority and has immediate relevance for the goal of the individual. Patients might attempt to avoid the worsening of pain during physical activity. Patients might worry about the ineffectivity of previous medical interventions, and continue searching for other ways to manage their pain (Aldrich et al 2000). The feature these examples have in common is that the current goal of the individual is related to pain. In such situations, a hypervigilance to pain or pain-related information emerges (Crombez et al 2005). Attention is automatically shifted to pain or cues for pain (Peters et al 2002) and, once detected, attention dwells on pain and is difficult to disengage from (van Damme et al 2004). Hypervigilance to pain is largely automatic and emerges when pain has a high threat value. It is an unintentional and efficient process that occurs when the individual's current concern is to escape and avoid pain. Studies have revealed that attempts to suppress pain or fear can prove futile and might lead to a paradoxical increase of pain or anxious thoughts once the attempts at suppression are stopped (Koster et al 2003). Both the interruptive quality of pain and hypervigilance to pain are related to attributions about pain and expectations about the possibilities of having control of the situation.

Attributions and catastrophizing about pain

Attributions refer to the interpretation of events and the search for possible explanations of the complaints. For patients with chronic pain it is often difficult to make sense of the pain. Pain is of little diagnostic value for both the patient and the physician; pain is experienced as useless. Patients struggle with the 'mysterious' origin of their pain (Williams & Keefe 1991). Frequently, patients catastrophize about their pain. Although the criteria for catastrophizing about pain have never been explicitly stated, it has been broadly conceived of as an exaggerated negative orientation towards actual or anticipated pain experiences ('pain is the worst that can happen to me') (Sullivan et al 1995). Experimental studies have shown that a catastrophic style of thinking is related to higher pain intensity, worrying about pain, feelings of helplessness, and having difficulty directing attention away from the pain (Sullivan et al 2001). Catastrophizing about pain is also related to the personality characteristic negative affectivity, a general negative orientation towards oneself and the world. However, research has indicated that catastrophizing about pain is not always equated with this personality characteristic (Goubert et al 2004). Also, particular situations can facilitate catastrophizing about pain. Poor communication between patient and caregiver can , for example, give rise to catastrophizing about pain ('after many investigations the specialist still has not made a diagnosis; my condition will be so serious that he still has not dared to say something') (Houben et al 2005).

Expectations and perceived control

Self-efficacy is the confidence someone has in his or her own abilities to successfully perform specific tasks (Bandura 1977, Dolce et al 1986). This implies that the extent of self-efficacy varies according to the type of task. In this way, experienced self-efficacy for the performance of relaxation exercises might vary considerably from the self-efficacy for the performance of physical activities. Self-efficacy has shown to be related to the extent in which patients suffer from their pain (Turner et al 2005).

Patients have expectations about which situations exacerbate pain and about the long-term consequences of pain. These expectations instigate avoidance behavior (Crombez et al 1998). A particular expectation in patients with chronic back pain is the fear of movement, which is (erroneously) assumed to be a possible cause of (re)injury (Vlaeyen et al 1995a). This is called 'kinesiophobia' (Kori et al 1990). The research findings on 'kinesiophobia' can be summarized as follows (see Vlaeyen & Linton 2000 for a review):

- In patients suffering from chronic musculoskeletal pain, pain-related fear is associated with impaired physical performance (Al-Obaidi et al 2000, Crombez et al 1999, Heuts et al 2004, Nederhand et al 2004, Vlaeyen et al 1995a) and increased self-reported disability (Asmundson et al 1997, Vlaeyen et al 1995b) (Fig. 32.2).

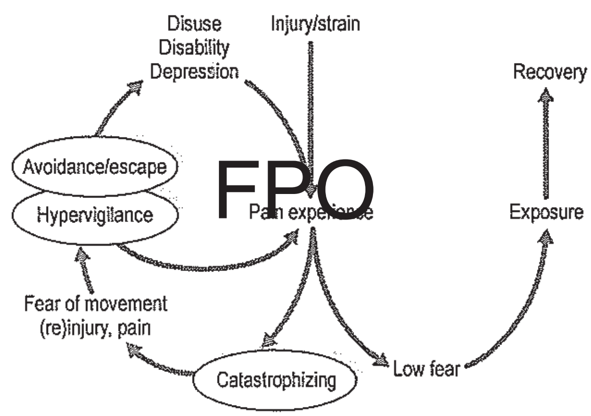


Fig 32.2 Cognitive–behavioral model of pain-ralated fear. If pain (e.g. caused by an injury or strain) is interpreted as threatening (pain catastrophizing), pain-related fear evolves. This leads to avoidance/escape, followed by disability, disuse and depression. The last will maintain the pain experiences, thereby fueling the vicious circle of increasing fear and avoidance. A more direct causal link between pain-related fear and pain is assumed to be mediated by hypervigilance. In patients who do not catastrophize, pain-related fear will probably not occur. These patients are likely to confront daily activities rapidly, leading to fast recovery. (Based on Vlaeyen et al 1995a, 1995b).

- In the open population, pain-related fear predicts future disability and health status (Buer & Linton 2002, Picavet et al 2002, Severeijns et al 2002).
- In patients with acute LBP, pain-related fear predicts future occupational disability (Fritz et al 2001).
- Educational interventions aimed at reducing negative attitudes and beliefs that mediate avoidance behavior reduce LBP related absence from work (Buchbinder et al 2001, Moore et al 2000).

Furthermore, Vowles & Gross (2003) found that work-specific fears were more important predictors of improved physical capability for work than changes in pain severity and fear of physical activity. Other studies found an association between fear-avoidance beliefs, work loss, and pain-related disability in both acute and chronic pain patients (e.g. Ciccone & Just 2001, Grotle et al 2004).

Reduction of pain-related fear in back pain

What treatment implications can be derived from the pain-related fear model? Peter Lang's (1979) bioinformational theory of fear predicts that two main conditions are needed to reduce fear: (1) the fear network needs to be activated; (2) new information needs to be available that disconfirms the fear expectations that are inherent to the fear memory. In clinical practice, several techniques are aimed at reducing fears in patients with chronic pain, with uneven success: verbal reassurance, education, physical exercise and /or graded activity, and exposure in vivo with behavioural experiments.

Verbal reassurance

Verbal reassurance generally consists of two classes of verbal cues: verbal statements intended to emotionally reassure patients directly, such as 'I wouldn't worry if I were you,' and verbal statements that indicate the absence of a medically relevant diseases 'There is nothing wrong with your back' (Coia & Morley 1998). Doctors can tell their patients that they do not have the particular disease they fear, often supported by showing them negative test results, and sometimes by providing an alternative nondisease explanation such as stress, muscle pain, physical overuse. The major problem with verbal reassurance is its inherent ambiguity: 'How can it be that there is nothing wrong with my back and yet I still feel pain?' A surprisingly small number of studies have examined the effects of verbal reassurance and the overall conclusion is that it does not reduce fears and can even have paradoxical effects: In the long run, reassurance can increase fear in a number of patients (Donovan & Blake 2000, McDonald et al 1996). This is not surprising, as verbal reassurance does not activate the fear network (but rather attenuates it), and neither does it provide new information that disqualifies previous beliefs. What moderately fearful patients need is an explanation of their symptoms that is credible and that provides a better account for the current situation than the disease model. To achieve this in the area of chronic musculoskeletal pain, a number of researchers have developed education material aiming at modifying beliefs about hurting and harming.

Education

Another way of reducing levels of fear is providing new information about the irrationality of the feared consequences. Patients can be educated in such a way that they view their pain as a common condition that can be self-managed as a useful first step, rather than as a serious disease or a condition that needs careful protection. One of the major goals of the educational part is to increase the willingness of the patient to finally engage in activities they have been avoiding for a long time. The aim is to correct the misinterpretations and misconceptions that have occurred early on during the development of the pain-related fear. One study evaluated a booklet (the back book) especially designed for lay people in a group of patients consulting their family physician with a new pain episode (Burton et al 1999). Although there were no differences in pain, patients receiving the experimental booklet showed a statistically significant early improvement in beliefs; this was maintained at 1 year. A greater proportion of patients with an initially high pain-related fear who received the experimental booklet had clinically important reductions in pain-related fear at 2 weeks, followed by a clinically important improvement in their disability levels. Moore and colleagues examined the effects of a two-session group intervention for back pain patients in primary care that is based on education. Besides the group meeting, there was also one individual meeting and telephone conversation with the group leader, and with a psychologist experienced in chronic pain management (Moore et al 2000). The intervention was supplemented by educational materials (book and videos) supporting active management of back pain. A control group received usual care supplemented by a book on back pain care. Participants assigned to the self-care intervention showed significantly greater reductions in back-related worry and fear-avoidance beliefs than the control group. A population-based public health prevention program was carried out in Victoria, Australia (Buchbinder et al 2001). The program consisted of a large media campaign using television and radio commercials, printed advertisements, outdoor billboards, seminars, workplace visits and publicity articles using positive messages of back pain. Positive results for this unique project were found for back pain beliefs both among patients and among doctors, and a decline in number of claims for back pain, rates of days compensated and medical payments for claims for back pain. There is also evidence that sub-CLBP can be managed successfully with an approach that includes clinical examination combined with information for patients about the nature of the problem, provided in a manner designed to reduce fear and give them reason to resume light activity (Indahl et al 1998).

Physical exercise/operant graded activity

Although most exercise and operant graded activity programs were originally not designed to reduce pain-related fear, but rather to directly increase activity levels despite pain, these programs might have fear-reducing effects. A study by Mannion et al (1999) compared three sorts of active treatment: (1) modern active physiotherapy; (2) muscle reconditioning on training devices; and (3) low-impact aerobics. After therapy, significant reductions were observed in pain intensity, frequency, pain disability, pain catastrophizing, and pain-related fear. These effects were maintained over the subsequent 6 months, with the exception of the patients receiving physiotherapy, who increased their levels of pain-related fear and disability. A subsequent study suggested that the improvements are likely a result of the positive experience of completing the prescribed exercises without undue harm (Mannion et al 2001). Similar findings have been reported after an operant graded activity program (Van Den Hout et al 2003).

Exposure *in vivo*

Philips (1987) was one of the first to argue for the systematic application of graded exposure to produce disconfirmations between expectations of pain and harm, the actual pain and the other consequences of the activity. She further suggested that:

> *These disconfirmations can be made more obvious to the sufferer by helping to clarify the expectations he/she is working with, and by delineating the conditions or stimuli which he feels are likely to fulfill his expectations. Repeated, graded, and controlled exposures to such situations under optimal conditions are likely to produce the largest and most powerful disconfirmations. (Philips 1987 p 279)*

Experimental support for this idea is provided by the match/mismatch model of pain, which states that people initially tend to overpredict how much pain they will experience but that after some exposures these predictions tend to be corrected to match with the actual experience (Rachman & Arntz 1991). A similar pattern was found in a sample of CLBP patients who were requested to perform four exercise bouts (two with each leg) at maximal force (Crombez et al 1996). During each exercise bout, the baseline pain, the expected pain, and experienced pain were recorded. As predicted, the CLBP patients initially overpredicted pain but, after repetition of the exercise bout, this overprediction was readily corrected. The expectancy did not seem to generalize to the exercise bout with the other leg as a small increase in pain expectancy re-emerged. Also, expectancies were immediately corrected after another performance. These findings have been replicated with two other physical activities: bending forward and straight leg raising (Goubert et al 2002).

In analogy with the treatment of phobias, graded exposure to back-stressing movements has been tested as treatment approach for back pain patients reporting substantial fear of movement/(re)injury (for a detailed description of the exposure *in vivo* protocol, see Vlaeyen et al 2002b). In a first replicated single-case cross-over experiment, four CLBP patients who were referred for outpatient behavioral rehabilitation and who reported substantial fear of movement/(re)injury (TSK score > 40), were randomly assigned to one of two interventions (Vlaeyen et al 2001). In intervention A, patients received the exposure first, followed by operant graded activity. In intervention B, the sequence of treatment modules was reversed. Daily measures of pain-related cognitions and fears were recorded with visual analog scales. Using time series analysis, we found that improvements only occurred during the exposure *in vivo*, and not during the graded activity, irrespective of the treatment order. Analysis of the pre-post-treatment differences also revealed that decreases in pain-related fear also concurred with decreases in pain catastrophizing and pain disability and in half of the cases also an increase in pain control. In a subsequent study, patients carried an ambulatory activity monitor at home for one week after each treatment module (Vlaeyen et al 2002b). Analyses revealed that decreases in pain-related fear again occurred at the introduction of the exposure module only. Additionally, these improvements concurred with decreases in pain disability, pain vigilance, and an increase in physical activity. In both studies, the exposure *in vivo* treatment was embedded in a multidisciplinary treatment program and this might have confounded the results. In two further studies, one of which was carried out in a different setting, the exposure *in vivo* was delivered as the sole treatment. Again, similar effects were found (Linton et al 2002, Vlaeyen et al 2002a). Because fear reductions occurred at the very beginning of the exposure treatment, during which education was also provided, a subsequent study was designed to disentangle the effects of education, graded activity, and graded exposure (de Jong et al 2005). After a 3-week no-treatment baseline measurement period, all patients received a psychoeducation session during which they were told that their pain was a common and benign condition that can be self-managed, rather than as a serious disease or a condition that needs careful protection, followed again by a 3-week no-treatment period. Then, random assignment to either 3-week exposure in vivo or 3-week graded activity occurred. Of interest was that psychoeducation reduced the reports of pain-related fear from all patients. However, fear was further reduced during exposure *in vivo*, but not during graded activity. Furthermore, perceived disability was not influenced by the educational session, and changed only during the exposure *in vivo* condition. These results suggest that education might reduce distress on a subjective level but that it does not change actual behaviors of the patients. Taken together, there is now preliminary evidence that graded exposure *in vivo* can be an effective treatment in patients with musculoskeletal pain who report substantial pain-related fear. Despite these promising results, interpretation should remain cautious because these studies had very small sample sizes. Randomized control trials with large samples and long-term follow-up measures are therefore warranted.

Summary

- As other emotional experiences, pain is never directly observable in itself but can only be inferred through three observable systems: psychophysiological reactivity, overt pain behaviors, and cognitive processes about pain and pain control. A behavioral analysis specifies the causes and maintaining factors of overt behaviours, psychophysiological reactivity, and beliefs in terms of explicit environmental events that can be objectively identified and that are potentially manipulable.
- Pain disability occurs when individual goals are not met because of the pain, and can be subject to a graded shift from structural/mechanical to cognitive/environmental control. In back pain, this shift occurs quite rapidly, probably within 4–8 weeks. Similarly, the presence of demonstrable biomedical findings does not guarantee that psychological or social factors do not contribute to the level of pain disability.
- Avoidance behavior is postulated to be one of the core mechanisms in sustaining chronic pain disability. In the acute pain situation, avoidance of daily activities that increase pain is a spontaneous adaptive reaction of the individual; it usually allows the healing process to occur. In chronic pain patients, however, avoidance behavior appears to persist beyond the expected healing time. Avoidance behavior can then be viewed as a dysfunctional response that promotes further disability, and a heightened awareness for somatic symptoms.
- Certain beliefs and expectations that patients hold about their pain influences the persistence of avoidance behavior. If the individual beliefs that further exposure to certain stimuli will increase pain, harm, and suffering, avoidance or escape will probably occur.
- Cognitive–behavioral approaches have been developed. These are not designed to remove pain, nor to teach patients how to be more stoic or let them believe that it is all in their mind. The aim is to decrease pain disability levels and to provide patients with the opportunity to learn and practice skills to cope better with pain. For this, behavioral and biomedical sciences are integrated in a transdisciplinary working model, characterized by active patient participation. These treatments appear effective and successful for a large number of patients.
- A specific group of patients is in need for a treatment for their pain that focuses on the irrational beliefs that pain is a signal of impending threat to the body. The associated fear of movement/(re)injury appears to play a pivotal role in the maintenance and exacerbation of chronic pain disability. Exposure-based treatments are developed to diminish the catastrophic cognitions and to gradually increase the activity levels of patients in line with their individual life goals. Such a treatment approach appears effective, although subsequent studies with larger samples and long-term follow-up data are needed.

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